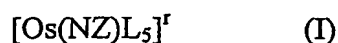


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**CLAIMS:**

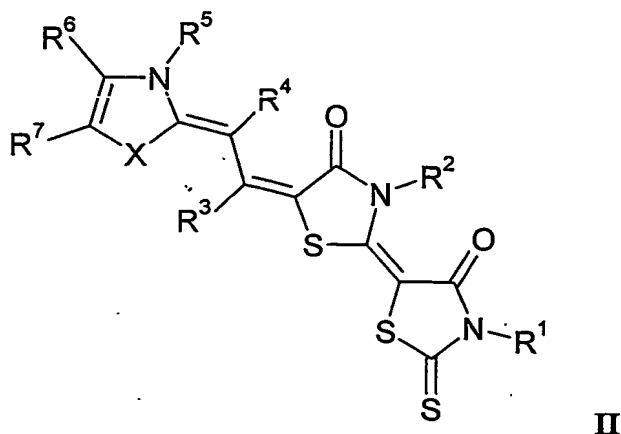
1. A photographic silver halide emulsion for use in photographic materials, said silver halide emulsion comprising a red sensitising trinuclear merocyanine dye and an osmium dopant according to formula I



- wherein Z is sulfur or oxygen,  
L is a ligand  
r is 0, -1, -2 or -3.

2. A photographic silver halide emulsion as claimed in Claim 1, wherein the osmium dopant is  $[\text{Os}(\text{NO})\text{Cl}_5]^{2-}$ .
3. A photographic silver halide emulsion as claimed in Claim 1 or Claim 2, wherein the red sensitising dye sensitises the silver halide emulsion to radiation in the range 600-690nm.
4. A photographic silver halide emulsion as claimed any one of the preceding claims, wherein the red sensitising trinuclear merocyanine dye is a compound according to formula II

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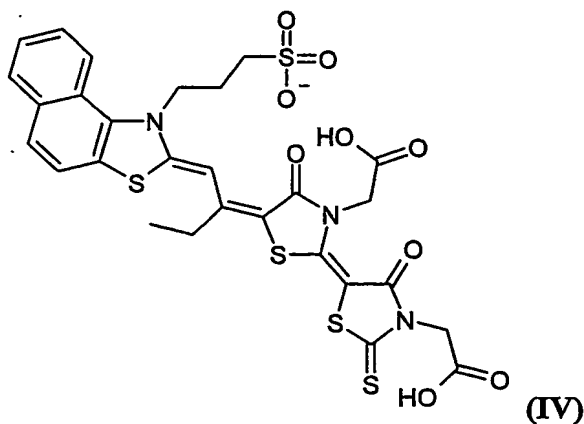
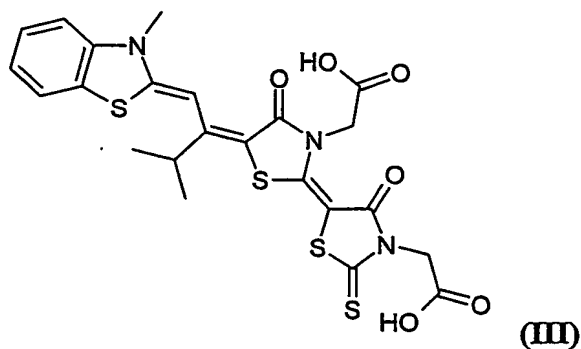
wherein X is S or Se;

R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are independently hydrogen, alkyl, substituted alkyl, alkenyl, substituted alkenyl, aryl, substituted aryl or an organic radical carrying a water solubilizing group and at least 2 members of R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup>, but not R<sup>3</sup> and R<sup>4</sup> together, are independently an organic radical carrying a water-solubilizing group; and

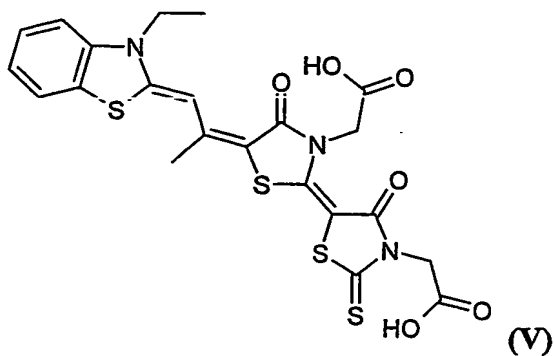
R<sup>6</sup> and R<sup>7</sup> each independently represent hydrogen, hydroxy, a halogen, an alkyl group, a substituted alkyl group, an alkenyl group, a substituted alkenyl group, an alkoxy group, a substituted alkoxy group, an alkylthio group, a substituted alkylthio group, an arylthio group, a substituted arylthio group, an aryl group, a substituted aryl group, an acyl group, a substituted acyl group, an acyloxy group, a substituted acyloxy group, an alkoxycarbonyl group, a substituted alkoxycarbonyl group, an alkylsulphonyl group, a substituted alkylsulphonyl group, a carbamoyl group, a substituted carbamoyl group, a sulphamoyl group, or R<sup>6</sup> and R<sup>7</sup> together represent the atoms necessary to complete an annellated carbocyclic ring system, which may bear one or more substituents, which may be the same or different and are chosen from the above substituents which R<sup>6</sup> and R<sup>7</sup> may independently represent.

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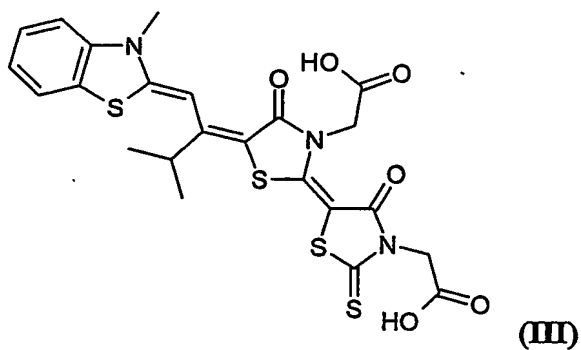
5. A photographic silver halide emulsion as claimed in Claim 4, wherein X is S, R<sup>1</sup> and R<sup>2</sup> are each independently an organic radical carrying a water-solubilizing group, R<sup>3</sup> is an alkyl group or a substituted alkyl group, R<sup>4</sup> is hydrogen, R<sup>5</sup> is an alkyl group, a substituted alkyl group or an organic radical carrying a water-solubilizing group and R<sup>6</sup> and R<sup>7</sup> together represent the atoms necessary to complete an annellated carbocyclic ring system such as, for example, a benzene ring or a naphthalene ring system.
6. A photographic silver halide emulsion as claimed in Claim 4, wherein the trinuclear merocyanine dye is selected from compounds according to formulae III, IV and V



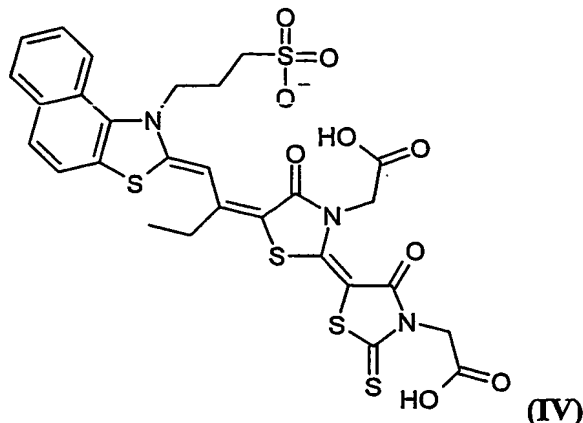
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7. A photographic silver halide emulsion as claimed in any one of Claims 4 to 6, wherein  $R^3$  is an alkyl group having 2 or more carbon atoms.
8. A photographic silver halide emulsion as claimed Claim 7, wherein  $R^3$  is an alkyl group selected from ethyl, propyl and isopropyl.
9. A photographic silver halide emulsion as claimed in Claim 8, wherein the trinuclear merocyanine dye is a compound according to formula III or formula IV



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10. A silver halide emulsion as claimed in any one of the preceding claims, wherein the sensitising dye is present in the silver halide emulsion in an amount of from 150 to 500 mg per mole equivalent of silver.
11. A silver halide emulsion as claimed in any one of the preceding claims, wherein the osmium dopant is present in the silver halide emulsion in an amount of  $10^{-10}$  to  $10^{-5}$  moles per mole equivalent of silver.
12. A silver halide emulsion as claimed in Claim 11, wherein the osmium dopant is present in the silver halide emulsion in an amount of  $5 \times 10^{-8}$  to  $1 \times 10^{-6}$  moles per mole equivalent of silver.
13. A silver halide emulsion as claimed in any one of the preceding claims, which further comprises an iridium dopant.
14. A silver halide emulsion as claimed in Claim 13, wherein the iridium dopant is  $[\text{IrCl}_6]^{2-}$ .
15. A silver halide emulsion as claimed in Claim 13 or Claim 14, wherein the iridium dopant is present in the silver halide emulsion

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in an amount of from  $10^{-10}$  to  $10^{-5}$  moles per mole equivalent of silver.

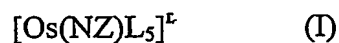
- 5           16.       A silver halide emulsion as claimed in Claim 15, wherein the iridium dopant is present in the silver halide emulsion in an amount of from  $5 \times 10^{-8}$  to  $1 \times 10^{-6}$  moles per mole equivalent of silver
- 10           17.       A silver halide emulsion as claimed in any one of the preceding claims, which is a silver chlorobromide emulsion comprising at least 50 mole% silver chloride.
18.       A silver halide emulsion as claimed in Claim 17, which comprises from 60 to 80 mole% silver chloride.
- 15           19.       A photographic material comprising a silver halide emulsion as defined in any one of Claims 1 to 18.
20.       A photographic material as claimed in Claim 19, which is a high contrast graphic arts film.
- 20           21.       A photographic material as claimed in Claim 19, which is a film for use in the preparation of a printed circuit board.
22.       A method of manufacturing a photographic material, said method comprising coating a silver halide emulsion as defined in any one of Claims 1 to 18 onto a photographic support.
- 25           23.       A method of manufacturing a printed circuit board, said method comprising image-wise exposing an electronic circuit layout pattern onto a photographic material as defined in Claim 21, developing the exposed photographic material to produce a photomask, placing
- 30

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the photomask in contact with a printed circuit board substrate, exposing the printed circuit board substrate through the mask and processing the exposed printed circuit board substrate.

- 5        24.        A method for reducing the extent of or preventing speed gain over time of a red-sensitive photographic silver halide emulsion, said method comprising incorporating into the silver halide emulsion a trinuclear merocyanine dye and an osmium dopant according to formula I

10



wherein        Z is sulfur or oxygen,

                  L is a ligand

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                  r is 0, -1, -2 or -3.

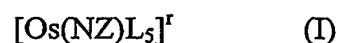
25.        A method as claimed in Claim 24, wherein the osmium dopant is  $[\text{Os}(\text{NO})\text{Cl}_5]$ .
- 20        26.        A method as claimed in Claim 24 or Claim 25, wherein the silver halide emulsion comprises a trinuclear merocyanine dye as defined in any one of Claims 4 to 9.
- 25        27.        A method as claimed in any one of Claims 24 to 26, which further comprises incorporating an iridium dopant into the silver halide emulsion.
28.        A method as claimed in Claim 27, wherein the iridium dopant is  $[\text{IrCl}_6]^{2-}$ .

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29. A method as claimed in any one of Claims 24 to 27, wherein the silver halide emulsion is a chlorobromide emulsion comprising at least 50 mole% of silver chloride.

- 5 30. Use of an osmium dopant according to formula I



wherein Z is sulfur or oxygen,

10 L is a ligand

r is 0, -1, -2 or -3

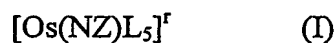
in combination with a red sensitising trinuclear merocyanine dye to minimise speed change over time of a silver halide emulsion.

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31. A use as claimed in Claim 30, wherein the trinuclear merocyanine dye is as defined in any one of Claims 4 to 9.

32. Use of an osmium dopant according to formula I

20



wherein Z is sulfur or oxygen,

L is a ligand

25

r is 0, -1, -2 or -3

and an iridium dopant in combination with a red-sensitising trinuclear merocyanine dye to reduce the extent of or prevent speed gain over time in a silver halide emulsion whilst maintaining a desired level of contrast.

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